Case Report

Reversal of the Intrusion of a Natural Tooth between Two Adjacent Implant Restorations: A Clinical Case Report

Chia-Hsien Wang, DDS
Resident Doctor, Department of Prosthodontic Dentistry, Taipei Medical University Hospital, Taipei, Taiwan

May-Show Chen, DDS, MS
Attending Doctor, Department of Prosthodontics, Taipei Medical University Hospital, Taipei, Taiwan
Assistant Professor, School of Dental Hygiene, College of Oral Medicine, Taipei Medical University, Taipei, Taiwan

Bou-Yue Peng, DDS, MS
Attending Doctor, Department of Oral Surgery, Taipei Medical University Hospital, Taipei, Taiwan
Instructor, School of Dentistry, College Of Oral Medicine, Taipei Medical University, Taipei, Taiwan

Shang-Lun Kuo, DDS, MS
Attending Doctor, Department of Prosthodontic Dentistry, Taipei Medical University Hospital
Lecture, School of Dentistry, College of Oral Medicine, Taipei Medical University, Taipei, Taiwan

Hsiu-Na Lin, DDS
Attending Doctor, Department of Prosthodontics, Taipei Chang-Gung Memorial Hospital, Taipei, Taiwan

Chien-Chih Chen, DDS, MS, PhD
Attending Doctor, Department of Prosthodontics, Cardinal Tien Hospital, Taipei, Taiwan

Demeral David Liu, DDS, PhD
Attending Doctor, Department of Periodontology, China Medical University Hospital,
Professor, School of Dentistry, College of Oral Medicine, China Medical University, Taichung, Taiwan

Corresponding author:

May-Show Chen, DDS, MS
Attending Doctor, Department of Prosthodontic Dentistry, Taipei Medical University Hospital
Lecture, School of Dentistry, College of Oral Medicine, Taipei Medical University, Taipei, Taiwan
No. 252, Wuxing St., Xinyi Dist., Taipei City 11031, Taiwan R.O.C.
Tel: +886-2-2737-2181#3211#5
E-mail: mayshowc@hotmail.com

Abstract

Conventionally, the intrusion of an abutment tooth in tooth-implant-supported fixed partial dentures is a troublesome problem, especially in dentures with non-rigid connectors. The clinicians have previously reported that the intrusion of a natural tooth also can be induced when the natural tooth is bounded on both sides by an implant restoration. This unusual case report discusses the case of a 58-year-old female who suffered from infra-occlusion of the upper left first premolar following the sequential implantation of restorations over the adjacent canine and second premolar. In addition to the infra-occlusion, a 6 mm pocket and an angular bony defect on the mesial side of this tooth associated with a PDL widening, tight proximal contacts, and a mild percussion pain were noticed. In order to resolve the infra-occlusion, the old PFM restoration was removed and restored with a provisional crown with open interproximal and occlusal contacts. After one year of intensive and sequential adjustments of the proximal and occlusal contacts, the intrusion of the upper left first premolar was almost completely reversed and the periodontal defect was significantly improved.

Key words: dental implant, implant prostheses, tooth intrusion

Introduction

Conventionally, the intrusion of an abutment tooth in tooth-implant-supported fixed partial dentures is a troublesome complication, especially in dentures with non-rigid connectors[1, 2, 3]. Several theories have been proposed to address this issue, but the mechanisms underlying the responses to this intrusion phenomenon remain unclear[4, 5, 6, 7]. In addition to such conventional intrusion of a natural abutment in a tooth-implant-supported fixed prosthesis, the clinicians have previously reported the intrusion of a free-standing natural tooth when the natural tooth is bounded on both sides by an implant restoration[8].

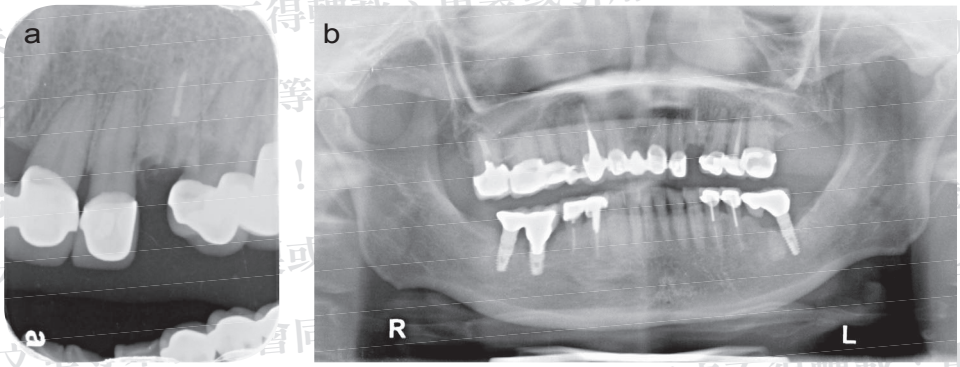

Fig. 1 Periapical and panoramic radiographs of tooth #23, an unrestorable fractured tooth, which was extracted in the following treatment sequence.

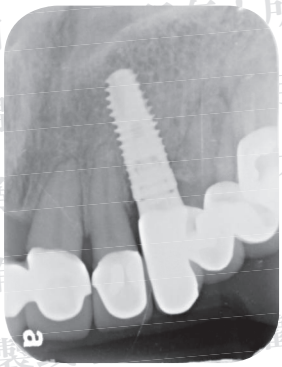

Fig. 2 Periapical radiograph of tooth #23, which was replaced with an implant-supported prosthesis on July 9, 2013.

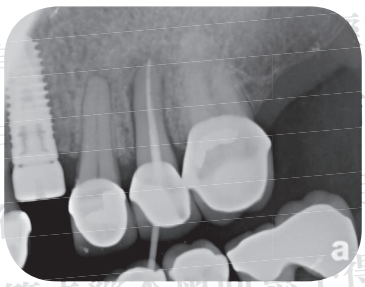

Fig. 3 Periapical radiograph of tooth #25, an unrestorable fractured tooth, which was extracted in the following treatment sequence.

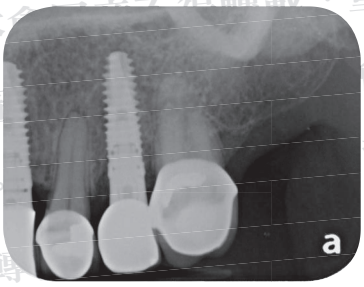

Fig. 4 Periapical radiograph of tooth #25, which was replaced with an implant-supported prosthesis on June 11, 2014.

Fig. 5 Tooth #24 was shown to exhibit infra-occlusion in a clinical examination.

In this unique case report, we sought to describe this unusual intrusion phenomenon of a natural tooth intruding right between two adjacent implant restorations and to provide a solution for reversing the intrusion and fixing the associated periodontal defects.

Clinical Report

A 58-year-old partially dentate woman came to the Department of Prosthodontics of Taipei Medical University Hospital for the restoration of a fractured upper left canine on November 26, 2012.

In the intra-oral and radiographic examination, we found that tooth #23 (according to the FDI system of tooth nomenclature) was fractured and not restorable (Fig. 1). Therefore, tooth #23 was extracted and replaced on December 11, 2012, with a dental implant (Xive®; FRIADENT) 4.5 mm in diameter and 13 mm in length, following the standard protocol. The dental implant in the tooth #23 area was uncovered and loaded uneventfully six months later on July 9, 2013, with a cement-retained all-ceramic crown restoration (Fig. 2). At the impression appointment for the dental implant restoration of the tooth #23 area, a fistula with a solitary deep narrow pocket was found over the buccal side of tooth #25, and a root fracture was suspected (Fig. 3). So, tooth #25 was extracted and replaced on November 14, 2013, with a dental implant (Xive®; FRIADENT) 3.8 mm in diameter and 13 mm in length. The dental implant in the tooth #25 area was restored with a cement-retained zirconia crown on June 11, 2014 (Fig. 4).

During a routine check-up conducted on September 11, 2015, the patient complained that tooth #24 between the two dental implant restorations had become shorter with an unpleasant progressive enlargement of the inter-occlusal gap (Fig. 5). Upon conducting an intra-oral examination, we found infra-occlusion of tooth #24 with a tight proximal

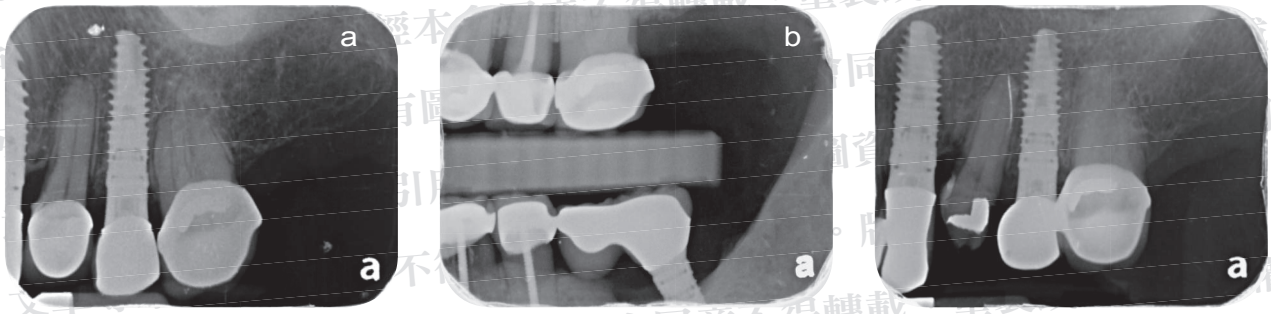

Fig. 6 (a) Periapical radiograph before crown removal of tooth #24 on September 23, 2015.
(b) Bitewing radiograph showing the gap beneath the original crown tooth #24 in 2012.

Fig. 7 Periapical radiograph after crown removal of tooth #24 on September 23, 2015.

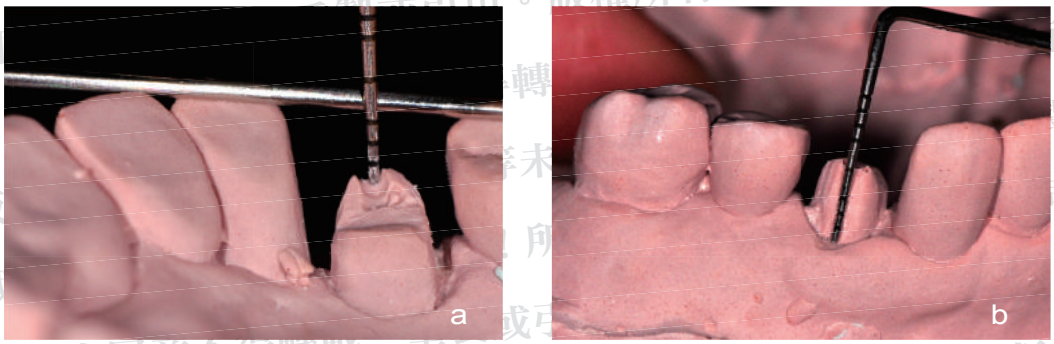

Fig. 8 Stone cast of the relationship between tooth #24 and the tooth #25 dental implant made on September 23, 2015.

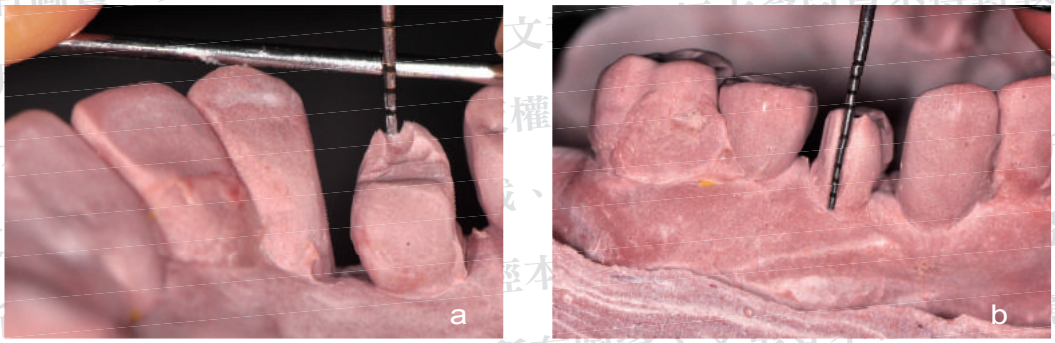

Fig. 9 Stone cast of the relationship between tooth #24 and the tooth #25 dental implant made on September 27, 2016.

contact and a 6 mm mesial pocket depth. A periapical radiograph revealed that the root apex of tooth #24 was at the level of the 5 screw thread from the apex of the tooth #25 dental implant, and an angular bony defect was found on the mesial side of tooth #24 (Fig. 6). However, the root apex of tooth #24 had been at the level of the 7 screw thread from the apex of the tooth #25 dental implant at the time of the insertion of the implant-supported prosthesis (Fig. 4). Tooth #24 showed grade I mobility and mild percussion pain (Fig. 6). To solve the infraocclusion problem and address the associated clinical symptoms and signs, and to fix the gap between the tooth structure and the porcelain-fused-to-metal crown of tooth #24 (Fig. 6-b), the crown was removed and the provisional crown was delivered without occlusal and proximal contacts (Fig. 7). Because we intentionally reversed the intrusion, biting sensitivity, and periodontal defects, the patient was put on an intensively regular one-month follow-up schedule. Scaling/root planning, local subgingival curettage, and oral hygiene instruction were

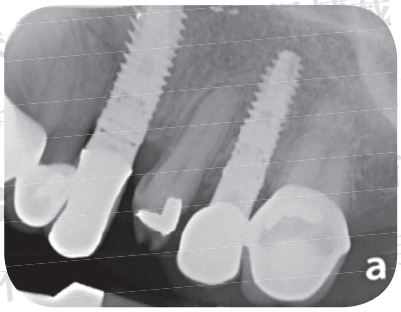

Fig. 10 Periapical radiograph of the relationship between tooth #24 and the tooth #25 dental implant on September 27, 2016.

performed. In addition to the periodontal care, the adjustment of the provisional crown was performed to remove occlusal and proximal contacts. One year after the delivery of the provisional crown, tooth #24 had been extruded by 2.5 mm (Figs. 8, 9), and the periodontal condition was significantly improved while the percussion pain was substantially relieved. More importantly, the periodontal reevaluation data regarding tooth #24 showed a decrease in the mesial probing depth and the tooth's mobility. In addition to this clinical improvement, periapical radiography revealed that the root apex of tooth #24 was at the level of the 6.5 screw thread from the apex of the tooth #25 dental implant, with a significant reduction of the mesial angular bony defect and improvement of the trabecular projection (Fig. 10).

Discussion

Various biological and mechanical complications of dental implants have been reported in the previous literature. The intrusion of an abutment tooth in tooth-implant-connected fixed partial dentures is one common problem affecting such dentures. Various possible reasons for the intrusion of an abutment tooth have been proposed, including: (1) disuse atrophy, (2) differential energy dissipation, (3) mandibular flexure and torsion, (4) flexure of fixed partial denture frameworks, (5) impaired rebound memory, (6) debris impaction or microjamming, and (7) the ratchet effect[4-7, 9-12]. To the best of our knowledge, only one clinical report in the previous literature has discussed the intrusion of a free-standing natural tooth adjacent to implant restorations[8]. In that article, Wang et al.[8] suggested that the possible mechanisms underlying the response to such an intrusion are the impaired rebound memory and mechanical binding. Furthermore, the uneven marginal ridges described in their case might have contributed to the intrusion and mechanical locking between the contact areas of the two adjacent osseointegrated implant-supported prostheses. The impaired rebound memory and mechanical binding were proposed for the further intrusion. In our clinical scenario, the intrusion of the upper left first premolar tooth did not occur when only one adjacent implant restoration, for the upper left canine, was placed. This might have been due to the resilience of the periodontal ligament of the upper left distal second premolar providing movement and rebound of this natural tooth.

Once both adjacent implant restorations had been delivered, however, the intrusion of this natural tooth was prominent. In the aforementioned previous report, Wang et al.[8] only removed the distal proximal contact to allow the spacing for reversal of the intrusion. However, we reduced the occlusal and both proximal contacts to allow for extrusion of the intruding tooth due to the future replacement of its old PFM crown. The article by Wang et al.[8], which was based on their clinical observations, suggested two clinical guidelines. First, when a natural tooth is bounded by implant restorations on both sides, the contact area should be carefully adjusted to prevent intrusion of the natural tooth. Second, reversal of an intrusion of this type may occur if the contact areas are corrected. In the current case, we intentionally aimed to free the occlusal and proximal contacts to reverse the periodontal defects and infra-occlusion induced by a natural tooth bounded on both sides by two sequential dental implants.

This clinical case report describes the treatment and management of the intrusion of a natural tooth bounded by two adjacent implant restorations. Though the mechanisms underlying the response to such an intrusion remain unclear, the reversal of the intrusion and periodontal defects were obtained after an intensive series of adjustments of the proximal and occlusal contacts.

References

1. Wei H, Tomotake Y, Nagao K, Ichikawa T. Implant prostheses and adjacent tooth migration: preliminary retrospective survey using 3-dimensional occlusal analysis. Int J Prosthodont 2008; 21:302-4.
2. Daftary F, Mahallati R, Bahat O, Sullivan RM. Lifelong craniofacial growth and the implications for osseointegrated implants. Int J Oral Maxillofac Implants 2013; 28:163-9.
3. Pikner SS, Gröndahl K, Jemt T, Friberg B. Marginal bone loss at implants: a retro- spective, long-term follow-up of turned Branemark System implants. Clin Implant Dent Relat Res 2009; 11:11-23.
4. English CE. Root intrusion in tooth-implant combination cases. Implant Dent 1993;2:79-85.
5. Sheets CG, Earthman. Natural tooth intrusion and reversal in implant-assisted prosthesis: Evidence of and a hypothesis

for the occurrence. J Prosthet Dent 1993; 70:513-20.

6. Shrets CG, Eathinan JC. Tooth intrusion in implant-assisted prosthesis. J Prosthet Dent 1997; 77:39-45.
7. Pesun IJ. Intrusion of teeth in the combination implant-to-natural-tooth fixed partial denture: A review of the theories. J Prosthodont 1997; 6:268-77.
8. Tong-Mei Wang, Ming-Shu Lee, Sang-Heng Kok, Li-Deh Lin. Intrusion and reversal of a free-standing natural tooth bounded by two implant-supported prostheses: A clinical report. J Prosthet Dent 2004; 92:418-22.
9. Rieder CE, Parel SM. A survey of natural tooth abutment intrusion with implant-connected fixed partial dentures. Int J Periodont Rest Dent 1993; 13:335-47.
10. Cho GC, Chee WW. Apparent intrusion of natural teeth under an implant supported prosthesis: A clinical report. J Prosthet Dent 1992; 68:3-5.
11. Strflik DE, Parr GR, Sisk AL. Histomorphometry of the dental implant-bone interface: One year result of a comparative investigation in dogs. Int J Oral Maxillofac Implants 1994; 9:501-12.
12. Steflik DE, Sisk AL, Parr G. Correlative transmission electron microscopic and scanning electron microscopic observation of the tissues supporting endosteal blade implants. J Oral Implants 1992; 18:110-20.